Research Theme: Actin Cytoskeleton, Mechanobiology & Cell Cycle

Research Project Title: Mechanistic studies of LLPS-mediated actin assembly via reconstitution

Principal Investigator/Supervisor: Nanyang Asst/Prof Yansong Miao

Co-supervisor/ Collaborator(s) (if any):

Project Description

a) Background:

In eukaryotes, actin filament forms intracellular arrays to provide mechanical forces that power diverse cellular processes, by exerting forces on the membrane for endocytosis, polarized cell growth, cancer cell invasion, cell mobility, and immune-response. To coordinate cellular processes under cell signaling, cells generate distinct actin filament networks in a common cytoplasm. Branched actin filament networks are nucleated by the Arp2/3 complex, which concentrate at sites of clathrin-mediated endocytosis in a structure called an actin patch, and at the leading edge of motile cells. In contrast, bundles of unbranched actin filaments, which sometimes mediate vesicle trafficking, or form myosin-containing contractile bundles, are often nucleated by formin proteins. Each type of these F-actin networks maintains precise dynamic nucleation, elongation, and depolymerization, which are regulated by actin binding proteins (ABPs) at different steps. Cooperative and competitive interactions of ABPs regulate actin remodeling during various signaling events, which usually trigger certain molecular condensation of ABPs to reorganize actin assembly. Understanding the molecular mechanisms underlying interactions and recruitment of ABPs is extremely important to understand the coordinated cellular machinery in actin assembly during signaling. Highly motivated students are welcome to apply this challenging and exciting project in the LLPS field. As the EMBO affiliated lab, the successful candidate will receive rigorous training in these areas and have opportunities to learn top-notch biological systems from EMBO or EMBL workshops/courses.

b) Proposed work:

We have several exciting projects going on to understand how the cell regulates individual ABPs, respectively, to assembly into different types of actin networks for specific cellular processes. We are currently using an integrated approach to address above questions, including: a novel in vitro reconstitution system, fluorescence imaging based cell biology, mass spectrometry, genetics and biochemistry methods. (please see more details at https://yansongmiao.wordpress.com/)

Supervisor contact:

If you have questions regarding this project, please email the Principal Investigator:
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SBS contact and how to apply:

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Please apply at the following:

http://admissions.ntu.edu.sg/graduate/R-Programs/R-WhenYouApply/Pages/R-ApplyOnline.aspx